

# memorandum

DATE: June 27, 1997

REPLY TO

ATTN OF: Office of Environmental Policy and Assistance: Ostrowski:64997

SUBJECT: INFORMATION -- LEAD AND LEAD PRODUCTS CONTAMINATED WITH  
RADIOACTIVE MATERIAL

TO: Distribution

The purpose of this memorandum is to inform Department of Energy program and field offices of a recent investigation conducted by the Illinois Department of Nuclear Safety into the source and distribution of lead and lead products contaminated with radionuclides. A summary of this investigation is attached for your information.

Although we have no information indicating any DOE operations were affected, EH-412 advises any DOE offices that believe there is a potential concern to make appropriate measurements and contact their supplier to determine whether or not their radiation shielding products are possibly contaminated. If you have any questions concerning this matter please contact Hal Peterson, EH-412 at (202) 586-9640 or by e-mail to [harold.peterson@eh.doe.gov](mailto:harold.peterson@eh.doe.gov) or Joel Rabovsky, EH-52 at (301) 903-2135 or [joel.rabovsky@eh.doe.gov](mailto:joel.rabovsky@eh.doe.gov). I would like to express appreciation to Gordon Appel, Deputy Director of the Illinois Department of Nuclear Safety, for providing information on this matter to the Department.

*Original signed by:*

Andrew Wallo III  
Director  
Air, Water and Radiation Division

Attachment

## LEAD AND LEAD PRODUCTS CONTAMINATED WITH RADIOACTIVE MATERIAL<sup>1</sup>

Background: The Illinois Department of Nuclear Safety recently learned that lead and lead products, including medical shielding devices (lead aprons, etc.) were being distributed widely in Illinois and other parts of the country. The Illinois Department of Nuclear Safety evaluated the nature of the contamination and determined that it did not represent a threat to health and safety. This occurrence may be of concern because of the use of many of the resultant lead products as medical devices and the fact that manufacturers and customers may be unaware of the contamination in other products.

Nature and Impact of Contamination: According to the Illinois Department of Nuclear Safety, the lead and lead products are contaminated with the radionuclides lead-210 (Pb-210) and its daughter nuclides bismuth-210 (Bi-210) and polonium-210 (Po-210). The half-life of lead-210 is approximately 22 years, bismuth-210 is approximately 5 days, and polonium-210 is approximately 138 days. The identification of the radionuclides was based on results of analyses from the Illinois Department of Nuclear Safety's certified radiochemistry laboratory for five samples. Measured activity for samples is approximately  $4 \pm 2$  nanocuries per gram of lead material. Analysis results for all samples are consistent, and the nature of the measurements confirmed the absence of the parent isotopes for Pb-210, particularly radium-226 (Ra-226).

Radiation resulting from the contamination of these materials does not represent a public health and safety hazard according to the Illinois Department of Nuclear Safety. The bismuth 1.16 MeV beta radiation is the primary contributor to dose followed by the k-shell x-rays. The energy of the x-rays is 88 keV or less with most less than 50 keV and an average x-ray energy of approximately 15 keV.

There is very low potential for exposure to radiation from any of the uses other than the radiation shielding clothing products (vinyl-lead and plastic-lead). The radiation level was estimated to be 0.6 to 3 millirem per hour at contact with these products. For comparison, the typical radiation dose to an individual in the United States is about one millirem per day. The contamination can be detected with a Geiger counter that has a thin window or with a sensitive ionization chamber, but is readily shielded with a thin layer (1 millimeter) of plastic or metal. However, there is the potential that, if a film badge/TLD is held near an apron made of the contaminated material for a long period of time with the window of the film badge/TLD holder directed toward the source of radiation, the recorded dose would be increased. The recorded dose would appear elevated, and would not reflect the actual dose received by the individual because of the low energy of the emitted radiation.

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<sup>1</sup> This summary was prepared on the basis of information provided to the Department of Energy by the State of Illinois Department of Nuclear Safety.

Source and Distribution of Contaminated Lead: Based on current information provided by the Illinois Department of Nuclear Safety, the provenance of radioactive material appears to be a foreign metals operation (in Brazil) which smelts cassiterite ore (tin oxide). Feed material for the smelter apparently does not include recycled metals, only ore. However, it is uncertain if the radioactivity was introduced to the smelting product as a discrete (radium) source or as part of the ore (uranium).

Beginning in November/December 1996, the smelter's import agent apparently arranged the import of a smelter byproduct (described as solder-like material) that was 65% Sn, 34.5% Pb and 0.5% Bi, containing the lead-210 contamination. According to the import agent, the only United States customer for this product was a refiner which claims it had only one customer for lead refined from this solder-like material. The refiner's customer uses crude lead (called bismuth lead) to make lead products and lead powder for use by other manufacturers. The contaminated lead was sold to customers in the United States and Canada.

The understanding of the Illinois Department of Nuclear Safety is that the contaminated lead powder was used to manufacture a variety of products consisting of: lead-vinyl or lead-plastic products used to make radiation shielding materials for x-ray machine drapes, aprons and gonad shields, and sheet shielding; brushes for electric motors; environmentally safe projectiles (bullets); pipe dope for threaded connections, such as natural gas supply pipes (use of leaded pipe dope on water supply lines is likely precluded by regulation); other lubricants used in the oil and gas industry (mostly overseas); weights in the heads and shafts of golf clubs; lead shot; lead roof flashing; and galvanizing compounds..

Some companies which distribute these radiation shielding products have initiated a voluntary recall. Based on current information, it appears that it is only products manufactured from lead processed by the one lead supplier between November/December 1996 and May 28, 1997, that may be contaminated with radioactive material.